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Group Report

1964-45

H. E. Frachtman

Haystack Pointing System:
Moon

10 September 1964

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MASSACHUSETTS INSTITUTE OF TECHNOLOGY
LINCOLN LABORATORY

HAYSTACK POINTING SYSTEM: MOON

H. E. FRACHTMAN

Group 62

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ABSTRACT

This report describes the procedure used by the Haystack pointing computer program for obtaining the celestial coordinates of the Moon at any time.

Accepted for the Air Force
Franklin C. Hudson, Deputy Chief
Air Force Lincoln Laboratory Office

I. INTRODUCTION

MOONTRACK is a program in the Haystack Univac 490 pointing system whose output is the celestial coordinates of the Moon at a given time. The program computes the coordinates by 4th difference interpolation in the tables of the apparent right ascension, declination, and radius vector of the Moon published in The American Ephemeris. The rates of change of the three quantities are computed by numerical differentiation.

II. INPUTS TO PROGRAM

A. Inputs Furnished by Core Memory

The program uses the registers listed in Table I for input information. The year and day are used to select the appropriate entries from the ephemeris. The coordinates of the Moon are interpolated for the time which is the sum of the times in CELTIME and DELTATEE.

B. Inputs Furnished by Magnetic Tape

The tape format of the Moon Ephemeris, which has been edited and recorded on tape by a 7094 program described in Reference (1), is shown in Fig. 1. Each block of 192 words covers a period of one day. The ephemeris for each day required 8 words for each of 24 hours. The program does not make use of the hour-year-month-day words in the block. The tape must be on Unit 1 (normally Servo B) of the Univac 490.

III. PROGRAM OUTPUTS

A. Outputs Left in Core Memory

The apparent celestial coordinates of the Moon, corresponding to the time in the register CELTIME, together with their numerical derivatives, are stored in the appropriate registers, as illustrated in Table II.

<u>Register</u>	<u>Contents and Scaling</u>
W(CELTIME)	Days B28
W(DELTATEE)	Days B28
U(YEARMONTH)	Year B15 (4 decimal digits)
L(YEARMONTH)	Month B0
L(DAY)	Day of Year B0
W(EQUATOR)	Equatorial radius of Earth B17

TABLE I
Core Memory Inputs to MOONTRACK Program

NOTE: Notation "B28" means
that the binary point is to the
right of bit 28.

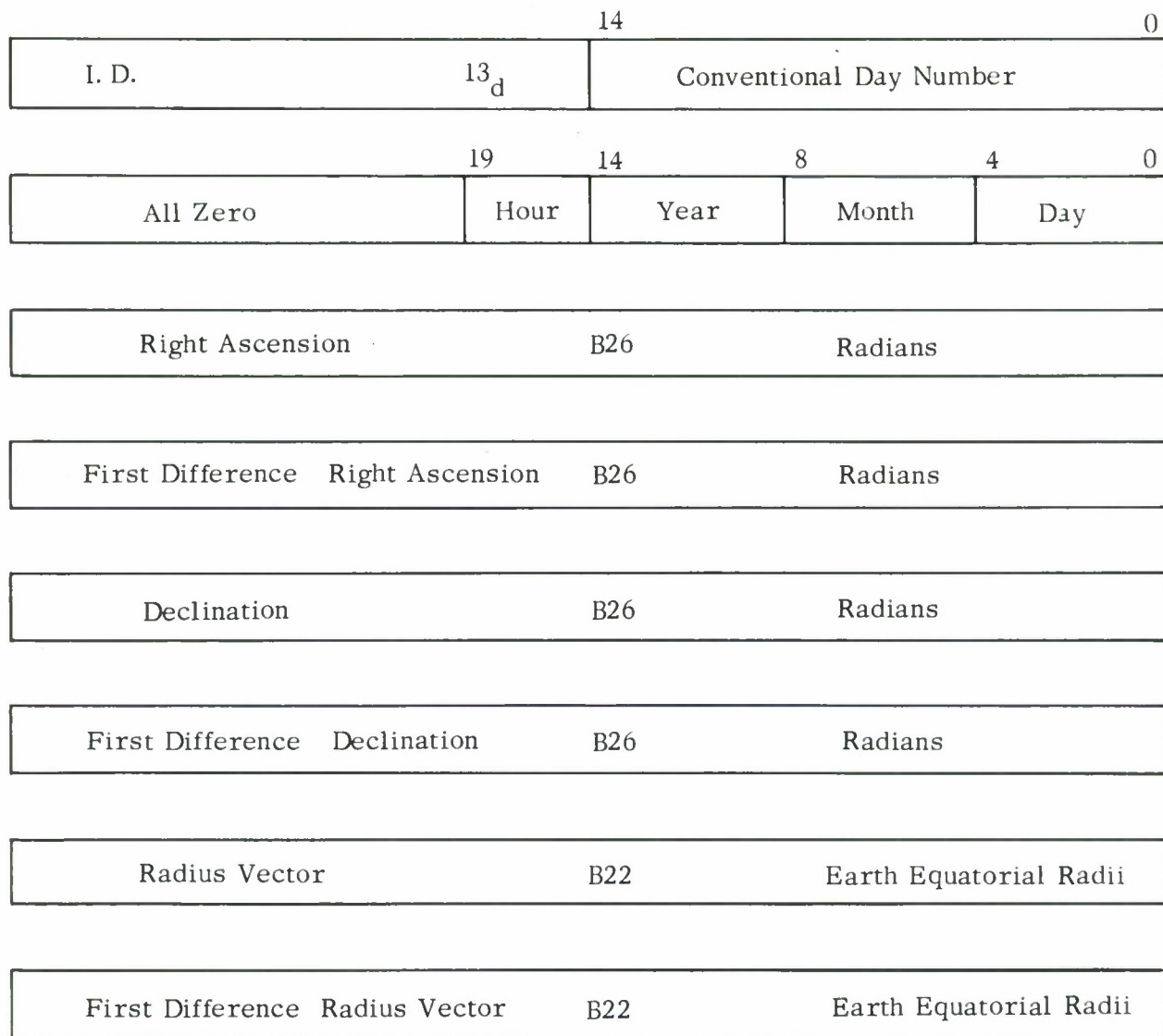


Fig. 1. Magnetic Tape Format for Moon Ephemeris

<u>Register</u>	<u>Contents and Scaling</u>
W(RA)	Apparent Right Ascension B27 in revolutions
W(DEC)	Apparent Declination B27 in revolutions
W(RADIUS)	Distance from center of Earth to center of Moon, B22 Earth Equatorial radii
W(RADOT)	Numerical Derivative of Right Ascension B37 radians/sec
W(DEC DOT)	Numerical Derivative of Declination B37 radians/sec
W(RADIUS DOT)	Numerical Derivative of Radius Vector B24 nautical miles/sec

TABLE II
Core Memory Outputs of MOONTRACK Program

B. Typewriter Outputs

During initialization the MOONTRACK program will type, using the INTERCOM subroutine, certain information concerning the Moon. Items printed are:

1. Julian Day corresponding to values in YEARMONTH, DAY, and CELTIME (7 digits).
2. Apparent Right Ascension of the Moon (Hours, Minutes, Seconds to hundredths).
3. Apparent Declination of the Moon (Degrees, Minutes, Seconds to hundredths).
4. Day of Year corresponding to values in YEARMONTH and DAY (up to 3 digits).
5. Universal Time for which the coordinates are interpolated. It is the time in CELTIME at initialization (Hours, Minutes, Seconds to hundredths).
6. The distance between the centers of the Earth and the Moon (Earth's Equatorial radii to millionths).
7. The words "OBJECT MOON".

If, after a search through 12 files on Unit 1 (or the finding of an end of tape mark), the moon ephemerides are not found, the program will type "MOON EPHEMERIS FOR X/Y NOT AMONG FIRST 12 FILES" and will exit to the master control program error return. "X" and "Y" indicate the current month and year, respectively.

If there is a tape servo malfunction during search, the program will type "IIC STATUS S1 ZZ" and will exit to the master control program error return. The two digit octal number "ZZ" comes from the tape status word and indicates the error condition.

IV. ASTRONOMICAL SIGNIFICANCE

The apparent right ascension and declination of the Moon in the ephemerides are referred to the true equinox and equator of date and are corrected for planetary aberration. They are geocentric apparent quantities; the parallax correction is made by the coordinate conversion program (COCON) in the Haystack system. The values in the tables are computed for Ephemeris Time as argument. The equation

$$ET = UT + \Delta T$$

is used to convert from Universal Time to Ephemeris Time. The constant ΔT , represented by the number in the register DELTATEE is approximately 35 seconds.

The values for the radius vector and first difference of the radius vector which appear on the ephemeris tape (Figure 1) are computed from the Moon's horizontal parallax which occurs in the source data. The formula

$$D = \frac{1}{\sin h}$$

is used by the tape preparation program (Reference 1) to compute the distance D, in units of Earth's equatorial radii, from the geocentric equatorial horizontal parallax h. The register EQUATOR contains a number which represents the Earth's equatorial radius in nautical miles.

V. PROGRAM DETAILS

The MOONTRACK program is a subroutine of the Haystack Univac 490 pointing program. The initialization section begins at MOONINIT, the working section at MOONCONT. There are several closed subroutines within MOONTRACK. These are: DAYFIND, STATUSCK, INTERPOL, LEFRNDOFF, and MOONTIME. A listing of the program is given in Appendix I.

A. Initialization

The program, upon initialization, stores an RIL instruction in the tape channel internal interrupt register and an RJP STATUSCK instruction in the external interrupt register. The area in core into which the tape data will be read is cleared, together with some additional registers. This is done to make diagnosis easier in case of malfunction.

The daily Moon ephemeris entries are serially numbered by the program which generates the magnetic tape (Reference 1). These serial numbers are called "Conventional Day Numbers" (CDN). An arbitrary decision was made to produce and use tapes such that the CDN for 25 April 1963 is zero. The tape search process looks at the first word in each block, therefore, the MOONTRACK, program must compute the CDN of the block containing the entry for the required hour.

Using as inputs the year, day of year, and the effect of integral and half-integral values of CELTIME, the program computes the Julian Day number for the typewriter. The ephemerides start and run continuously from 25 April 1963, which has a Julian Day Number of 2438144.5; this number is subtracted from the computed Julian Day number and appears on tape as the Conventional Day Number. The first CDN in a block is stored in SAFE and TAPEBLOCK and the Moon identification number is added to generate a tape search comparison word.

Six blocks of Moon ephemerides are read to provide sufficient data for 4th difference Bessel interpolation for a four day period.

If the six block search and read operations are successful control is regained at NORMAL and the tape is rewound without interrupt or interlock.

The MOONTIME subroutine is entered to select and store the addresses of the ephemeris entries corresponding to the hour of the day and to compute the interpolation argument P. The register TIME2 contains a number representing the integral number of hours in the sum of CELTIME and DELTATEE.

Besselian interpolation of right ascension is done by the INTERPOL subroutine and the interpolated result is converted to hours, minutes, and seconds and stored for type out. Declination and distance are then interpolated and stored for type out. The other quantities which are to be typed out by INTERCOM are set up. Control is transferred to INTERCOM 7 times for the seven line type out, which completes operation of the initialization section of MOONTRACK.

B. Working Section

The MOONTRACK working section begins at MOONCONT. Control is transferred to the subroutine MOONTIME which selects the ephemeris entry corresponding to the current hour, stores the addresses of the table entries, and computes the interpolation argument P from the given value of CELTIME. The INTERPOL subroutine is then entered three times for the interpolation of right ascension, declination, radius and their time rates. All values are converted, scaled and stored properly in core memory and control is transferred to the master control program.

C. Subroutines

The initialization section of the MOONTRACK program makes use of the INTERPOL, DAYFIND, STATUSCK, LEFRNDOFF, and MOONTIME subroutines. The working section uses all except STATUSCK.

1. INTERPOL

The MOONTRACK interpolation subroutine uses Bessel's interpolation formula for (Reference 3) 4th difference interpolation of the Moon's ephemeris. The formula is

$$f_p = f_o + P\delta f_{1/2} + \frac{P(P-1)}{4} [\delta^2 f_o + \delta^2 f_1] \\ + \frac{P(P-1)(P-1/2)}{6} \delta^3 f_{1/2} + \frac{(P+1)P(P-1)(P-2)}{48} (\delta^4 f_o + \delta^4 f_1)$$

The quantities in the formula are associated with computer registers as follows:

- a. The address of f_0 is in index register 4.
- b. The interpolation argument P is in register P .
- c. $\delta f_{1/2}$ is in register GAMMA.
- d. $P(P-1)$ is in register PSQMP.
- e. $\delta^2 f_0 + \delta^2 f_1$ is in register DMINB.
- f. $\frac{P(P-1)}{6}$ is in register PSQMP6.
- g. $\delta^3 f_{1/2}$ is in register DMIN2CPLB.
- h. $(\delta^4 f_0 + \delta^4 f_1)$ is in register EP2BM2DMA.
- i. f_P is in the A register at the finish.

The subroutine also performs numerical differentiation using the following formula (Reference 3):

$$\begin{aligned} hf'_P = & \delta f_{1/2} + \frac{2P-1}{4} [\delta^2 f_0 + \delta^2 f_1] \\ & + \frac{3P^2 - 3P + 1/2}{6} \delta^3 f_{1/2} \end{aligned}$$

At the completion of the subroutine, hf'_P is stored in the register NUMDERIV.

When the subroutine is entered, Index Register 4 contains the address of f_0 and the register SETINTAD contains the address of $\delta f_{1/2}$ of the quantity to be interpolated. Index register 3 is used to acquire the other two first difference registers.

2. DAYFIND

The DAYFIND subroutine computes the Julian Day number and CDN corresponding to the current day.

3. STATUSCK

The STATUSCK subroutine is entered from the external interrupt register associated with the tape channel when the interrupt occurs. Examination of the status code generates four possible outcomes:

- a. If the code indicates a normal completion, control is returned to the program at the interrupted point.
- b. If the code indicates that an end of tape mark was sensed, the tape is rewound and a message indicating failure to find the ephemeris is printed by the typewriter. The message is described in Section III B. Control is passed to the error return of the master control program.
- c. If the code indicates that an end of file mark was sensed, the register IMPERIAL is indexed and tested for the value 12. When less than 12 an end of tape condition is assumed and the action is as described in (b) above.

d. If the code indicates anything but end of file, end of tape, or normal completion, a tape error has occurred. The message described in Section III B, indicating the type of error, is printed by the typewriter and control is passed to the error return of the master control program.

4. LEFRNDOFF

The LEFRNDOFF subroutine left shifts the AQ register the number of places indicated by the contents of index register 5 and rounds the A register.

5. MOONTIME

The MOONTIME subroutine computes the integral value of the current ephemeris hour and stores the addresses of the quantities to be interpolated. It computes the value of the interpolation argument P.

VI. PROGRAM LISTING

The next 23 pages show a APURT output of the MOONTRACK program in 3 parts:

- Pp. 10-26: Printout of MOONTRACK program.
- Pp. 27-29: Alphabetic list of program symbols.
- Pp. 30-32: Numerical list of program symbols.

.....	SPURT OUTPUT NO. 21C
MOONTRACK	FRACHTMAN*7/14/64	
NO. OF INSTRUCTIONS	03617	
00000	01412	
03611	THRU 03616	

MUONTRACK FRACHTMAN*7/14/64

CARDS	LI	IO LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTES
.	0000	MUONTRACK	PROGRAM					
.	0001	LUNAR	EQUALS 100	00000	C0232	C0002		
.	0002	MUNITAPE	EQUALS 55	00001	22242	42325		
.	0003	TAPEINPUT	EQUALS 35	00002	61000	C0000		
.	0004	EPHEM	MEANS C15*	00003	11030	00763		
.	0005	HENRY	U-TAG MOUNCONT*MOUNINIT	00004	15030	C0055		
.	0006		FO 1*MOUNP	00005	11030	C0764		
.	0007	MOUNINIT	ENTRY	00006	15030	C0035		
.	0010		ENT A*(IGNORE)	00007	12400	G2215		
.	0011		STR A*(MONTAPE)	00010	11000	C0000		
.	0012		ENT A*(INTERUP)	00011	15034	C1374		
.	0013		STR A*(TAPEINPUT)	00012	72400	C0011		1ST TEMP STORAGE
.	0014		ENT 84*11650	00013	10030	63323		817
.	0015		CL A*	00014	20300	C1000		
.	0016	ERASE	STR A*(YRREMA(N+R4))	00015	C7200	C0001		
.	0017		BJP 84*ERASE	00016	20000	C0001		
.	0020		ENT Q*(EQUATOR)	00017	15030	C0777		828
.	0021		MUL W(RHRSEC)	00020	11020	63147		
.	0022		LSH AQ*1*Q*PUS	00021	21000	C3651		
.	0023		ADD A*1	00022	15030	C0743		
.	0024		STR A*(ERNMSEC)	00023	C3000	C0036		
.	0025		ENT A*(YEARMONTH)	00024	23000	C0004		
.	0026		SUB A*19610	00025	15030	C1374		(C.1,2,3)
.	0027		STR A*(MONTHPRINT)	00026	22000	C2665		DAYS IN 4 YRS
.	0030		RSH AQ*300	00027	14030	C1375		
.	0031		DIV 4	00030	10030	C1374		
.	0032		STR A*(YRREMAIN)	00031	22000	C0555		
.	0033		MUL 14610	00032	34030	C1375		
.	0034		STR Q*(WHOLEYEAR)	00033	65000	C0323		
.	0035		ENT Q*(YRREMAIN)	00034	11030	C1411		
.	0036		MUL 3650	00035	15030	C1400		
.	0037		RPL Y+Q*(WHOLEYEAR)	00036	73670	C0532		
.	0040		RJP DAYFIND	00037	20030	C3613		
.	0041	TRYAGAIN	ENT A*(SAFE)	00040	13670	C0762		
.	0042		STR A*(TAPELOCK)	00041	15030	C1401		
.	0043		IN EPHEM*(EPHEMA)	00042	13670	C1401		
.	0044		ADD A*147775	00043	61000	C0043		
.	0045		EX-FCI EPHEM*(SRHIBIN)	00044	73670	C0533		
.	0046		STR A*(TAPESEARCH)	00045	36030	C1401		
.	0047		EX-FCI EPHEM*(TAPESEARCH)	00046	13670	C0762		
.	0050		JP \$	00047	12000	C0000		
.	0051		IN EPHEM*(EPHEMB)	00050	13670	C1401		
.	0052		RPL Y+1*(TAPESEARCH)	00051	61000	C0051		
.	0053		EX-FCI EPHEM*(SRHIBIN)	00052	73670	C0534		
.	0054		NU-UP	00053	36030	C1401		
.	0055		EX-FCI EPHEM*(TAPESEARCH)	00054	13670	C0762		
.	0056		JP \$					
.	0057		IN EPHEM*(EPHEMC)					
.	0060		RPL Y+1*(TAPESEARCH)					
.	0061		EX-FCI EPHEM*(SRHIBIN)					

SPURT OUTPUT NO. 21C

MOONTRACK FRACHTMAN*7/14/64

CARDS	LI (D LABEL	TA STATEMENT	LOC	F	JKB	Y	NOTES
•	OC062	NO-OP	00055	12000	CC00C		
•	UC063	EX-FCI EPHEM*W(TAPESEARCH)	00056	13670	C1401		
•	OC064	JP \$	00057	61000	CC057		
•	OC065	IN EPHEM*W(EPHEMO)	0006C	73670	C0535		
•	OC066	RPL Y+1*W(TAPESEARCH)	00061	36030	C1401		
•	OC067	EX-FCI EPHEM*W(SRHIBIN)	00062	13670	C0762		
•	OC070	NO-OP	00063	12000	CC00C		
•	UC071	EX-FCI EPHEM*W(TAPESEARCH)	00064	13670	C1401		
•	OC072	JP \$	00065	61000	CC065		
•	OC073	IN EPHEM*W(EPHEME)	00066	73670	C0536		
•	OC074	RPL Y+1*W(TAPESEARCH)	00067	36030	C1401		
•	OC075	EX-FCI EPHEM*W(SRHIBIN)	0007C	13670	C0762		
•	OC076	NO-OP	00071	12000	CC00C		
•	OC077	EX-FCI EPHEM*W(TAPESEARCH)	00072	13670	C1401		
•	OC100	JP \$	00073	61000	CC073		
•	OC101	IN EPHEM*W(EPHEMF)	00074	73670	C0537		
•	OC102	RPL Y+1*W(TAPESEARCH)	00075	36030	C1401		
•	OC103	EX-FCI EPHEM*W(SRHIB(N)	00076	13670	C0762		
•	OC104	NO-OP	00077	12000	CC00C		
•	OC105	EX-FCI EPHEM*W(TAPESEARCH)	00100	13670	C1401		
•	OC106	JP \$	00101	61000	C0101		
•	OC107	EX-FCI EPHEM*W(REWINONG)	00102	13670	C0765		
•	OC110	RJP MOUNTING	00103	65000	C0352		
•	OC111	ENT B4*L(RA00)	00104	12410	C1402		
•	OC112	ENT A*L(RA0IFAD)	00105	11010	C1405		
•	OC113	STR A*L(SETINTAO)	00106	15010	C1047		
•	OC114	RJP INTERPOL	00107	65000	C105C		
•	OC115	ENT Q*O*ANEG	00110	10700	CC00C		
•	OC116	SUB A*W(TWOPIE)*APOS	00111	21630	C1001		
•	OC117	ADD A*W(TWOPIE)	00112	20C30	C1001		
•	OC120	RSH AQ*270	00113	33000	CC033		
•	OC121	OIV W(HRAO)	00114	23030	C077C		
•	OC122	STR Q*W(RA2)	00115	14C30	CC621		
•	OC123	CL Q*	00116	10C00	CC00C		
•	OC124	RSH AQ*230	00117	33000	CC027		
•	OC125	OIV W(M(NSRAO)	0012C	23C30	CC771		
•	OC126	STR Q*W(RA4)	00121	14C30	CC624		
•	OC127	RSH AQ*300	00122	33000	CC036		
•	OC130	MUL W(SRAO)	00123	22C30	C0767		
•	OC131	LSH AQ*2*QPOS	00124	C7200	CC002		
•	OC132	ADD A*1	00125	20000	CC001		
•	OC133	STR A*W(RA6)	00126	15C30	CC627		
•	OC134	ENT B4*L(OCFAO)	00127	12410	C1403		
•	OC135	ENT A*L(OC0IFAO)	00130	11010	C1406		
•	OC136	STR A*L(SETINTAO)	00131	15010	C1047		
•	OC137	RJP INTERPOL	00132	65000	C105C		
•	OC140	STR A*W(GMT2)	00133	15C30	CC7C7		
•	OC141	ENT Q*O*APOS	00134	10600	CC00C		
•	OC142	CP A*	00135	15C40	CC00C		
•	OC143	RSH AQ*220	00136	C3C00	CC026		

FRACHTMAN*7/14/64

MOONTRACK

CARDS	L1 ID LABEL	TA STATEMENT	LDC	F	JKB	Y	NCTES
•	UC144	DIV W(MINSRAD)	00137	23030	CC771		
•	UC145	STR Q*W(DLN2)	00140	14030	CC654		
•	UC146	CL Q*	00141	10000	CC00C		
•	UC147	RSH AQ*24D	00142	23000	CC03C		
•	UC150	DIV W(SECSRAD)	00143	23030	CC775		
•	UC151	STR Q*W(DLN4)	00144	14030	CC657		
•	UC152	RSH AQ*30D	00145	23000	CC036		
•	UC153	MUL W(SARAD)	00146	22030	CC776		
•	UC154	LSH AQ*2*QPUS	00147	27200	CC002		
•	UC155	ADD A*1	00150	20000	CC001		
•	UC156	STR A*W(DLN6)	00151	15030	CC662		
•	UC157	ENT A*W(GMT2)*ANEG	00152	11730	CC707		
•	UC160	JP \$+3	00153	61000	CC156		
•	UC161	ENT A*W(DLN2)	00154	11030	CC654		
•	UC162	STR A*CPW(DLN2)	00155	15070	CC654		
•	UC163	ENT A*W(CELTIME)	00156	11030	CC133		
•	UC164	ENT Q*D*APUS	00157	10600	CC00C		
•	UC165	CP A*	00160	15040	CC00C		
•	UC166	RSH AQ*26D	00161	23000	CC032		
•	UC167	DIV W(HDAY)	00162	23030	CC772		
•	UC170	STR Q*W(GMT2)	00163	14030	CC707		
•	UC171	CL Q*	00164	10000	CC00C		
•	UC172	RSH AQ*23D	00165	23000	CC027		
•	UC173	DIV W(HDAY)	00166	23030	CC773		
•	UC174	STR Q*W(GMT4)	00167	14030	CC712		
•	UC175	RSH AQ*30D	00170	23000	CC036		
•	UC176	MUL W(SDAY)	00171	22030	CC774		
•	UC177	LSH AQ*2*QPUS	00172	27200	CC002		
•	UC200	ADD A*1	00173	20000	CC001		
•	UC201	STR A*W(GMT6)	00174	15030	CC715		
•	UC202	ENT A*W(CELTIME)*ANEG	00175	11730	CC133		
•	UC203	JP \$+3	00176	61000	CC201		
•	UC204	ENT A*W(GMT2)	00177	11030	CC707		
•	UC205	STR A*CPW(GMT2)	00200	15070	CC707		
•	UC206	ENT B4*L(DISTAD)	00201	12410	CC104		
•	UC207	ENT A*L(DISTIDFAD)	00202	11010	CC107		
•	UC210	STR A*L(SETINTAD)	00203	15010	CC107		
•	UC211	RJP INTERPOL	00204	65000	CC105C		
•	UC212	STR A*W(INITIAL18)	00205	15030	CC73C		
•	UC213	ENT A*W(JULIANDAY)	00206	11030	CC1376		
•	UC214	STR A*W(INITIAL3)	00207	15030	CC0565		
•	UC215	ENT A*L(DAY)	00210	11010	CC15C		
•	UC216	STR A*W(INITIAL12)	00211	15030	CC0576		
•	UC217	RJP U(INTERCOM)	00212	65020	CC426		
•	UC220	U-TAG INITIALJD*0	00213	CC055	CC00C		
•	UC221	RJP U(INTERCOM)	00214	65020	CC426		
•	UC222	U-TAG RGHTASC*0	00215	CC0577	CC00C		
•	UC223	RJP U(INTERCOM)	00216	65020	CC426		
•	UC224	U-TAG DLN*0	00217	CC0632	CC00C		
•	UC225	RJP U(INTERCOM)	00220	65020	CC426		

FRACHTMAN#7/14/64

CARDS	LI	ID	LABEL	TA	STATEMENT	MOONTRACK	LOC	F	JKB	Y	NCES
.	UC226				U-TAG INITIALDAT=0		00221	C0566		CC00C	
.	UC227				RJP U(INTERCOM)		00222	65020	63426		
.	UC230				U-TAG GMT=0		00223	C0665	CC00C		
.	UC231				RJP U(INTERCOM)		00224	65020	63426		
.	UC232				U-TAG INITIALDIS=C		00225	C0720	CC00C		
.	UC233				RJP U(INTERCOM)		00226	65020	63426		
.	UC234				U-TAG INITIAL800=0		00227	C0731	CC00C		
.	UC235	AIRPORT			RPL Y+1*(MOONINIT)		00230	36010	CC002		
.	UC236				JP A		00231	61070	CC00C		
.	UC237	MOONCONT			ENTRY		00232	61000	CC00C		
.	UC240				RPL Y+1*(MOONCONT)		00233	36010	CC032		
.	UC241				RJP MOONTIME		00234	65000	CC032		
.	UC242	HARVARD			ENT R4*(RAAD)		00235	12410	01402		
.	UC243				ENT A*(RADIFAD)		00236	11010	01405		
.	UC244				STR A*(SETINTAD)		00237	15010	01047		
.	UC245				RJP INTERPOL		00240	65000	0105C		
.	UC246				RSH AQ*300		00241	C3000	CC036		
.	UC247				MUL W(REVSRADIAN)		00242	22030	CC0761		
.	UC250				JP MOOSE*QPOS		00243	60200	CC045		
.	UC251				ADD A*1		00244	20000	CC001		
.	UC252	MOOSE			STR A*(RA)		00245	15030	63002		
.	UC253				ENT Q*(NUMDERIV)		00246	10030	01041		B 40
.	UC254				MUL W(RHRSEC)		00247	22030	0100C		
.	UC255				ENT B5*1		00250	12500	CC001		
.	UC256				RJP LEFRNDOFF		00251	65000	01364		
.	UC257				STR A*(RADOT)		00252	15030	63007		B 37
.	UC260				ENT R4*(OECAD)		00253	12410	01403		
.	UC261				ENT A*(OECIDFAD)		00254	11010	01406		
.	UC262				STR A*(SETINTAD)		00255	15010	01047		
.	UC263				RJP INTERPOL		00256	65000	0105C		
.	UC264				RSH AQ*300		00257	C3000	CC036		
.	UC265				MUL W(REVSRADIAN)		00260	22030	CC0761		
.	UC266				JP NEGDEC*ANEG		00261	60700	CC0527		
.	UC267				JP BEAVER*QPOS		00262	60200	CC0264		
.	UC270				ADD A*1		00263	20000	CC001		
.	UC271	BEAVER			STR A*(DEC)		00264	15030	63003		
.	UC272				ENT Q*(NUMDERIV)		00265	10030	01041		
.	UC273				MUL W(RHRSEC)		00266	22030	0100C		
.	UC274				ENT B5*1		00267	12500	CC001		
.	UC275				RJP LEFRNDOFF		00270	65000	01364		
.	UC276				STR A*(OECODT)		00271	15030	6301C		B 37
.	UC277				ENT R4*(OISTAD)		00272	12410	01404		
.	UC300				ENT A*(DISTIDFAD)		00273	11010	01407		
.	UC301				STR A*(SETINTAD)		00274	15010	01047		
.	UC302				RJP INTERPOL		00275	65000	0105C		
.	UC303				STR A*(RADIUS)		00276	15030	63006		B 22
.	UC304				ENT Q*(NUMDERIV)		00277	10030	01041		
.	UC305				MUL W(ERNMSEC)		00300	22030	CC0777		
.	UC306				ENT B5*4		00301	12500	CC004		
.	UC307				RJP LEFRNDOFF		00302	65000	01364		

MOONTRACK FRACHTMAN*7/14/64

CAROS	LI	IO	LABEL	TA	STATEMENT	LOC	F	JKR	Y	NOTES
.	OC310		SEAPORT	STR	A*(RAOTUSOOT)	00303	15030	63C11		B24
.	OC311		FLATNEG	EXIT		00304	61010	00232		
.	OC312		FLATNEG	CP	A*	00305	15040	0000C		
.	OC313			SUB	A*(HALFOAY)*APOS	00306	21630	0076C		
.	OC314			JP	LESSONE	00307	61000	00321		
.	OC315			RSH	AQ*300	0031C	33000	0036C		
.	OC316			DIV	W(HALFOAY)	00311	23030	0076C		
.	OC317			LSH	AQ*300	00312	70000	0036C		
.	OC320			SUB	A*1	00313	21000	00001		
.	OC321			JP	TWOLESS*AZERO	00314	60400	00317		
.	OC322			JP	TWOLESS*ANEG	00315	60700	00317		
.	OC323			ENT	A*-3*SKIP	00316	11140	77774		
.	OC324			ENT	A*-2	00317	11040	77775		
.	OC325		TWOLESS	JP	STORE	00320	61000	0034C		
.	OC326		LESSONE	ENT	A*-1	00321	11040	77776		
.	OC327			JP	STORE	00322	61000	0034C		
.	OC330		DAYFIND	ENTRY		00323	61000	0000C		
.	OC331			ENT	A*(CELTIME)*APOS	00324	11630	63133		
.	OC332			JP	FLATNEG	00325	61000	00305		
.	OC333			SUB	A*(HALFOAY)*APOS	00326	21630	0076C		
.	OC334			JP	LESSONE	00327	61000	00321		
.	OC335			RSH	AQ*300	00330	33000	0036C		
.	OC336			DIV	W(HALFOAY)	00331	23030	0076C		
.	OC337			LSH	AQ*300	00332	70000	0036C		
.	OC340			SUB	A*1	00333	21000	00001		
.	OC341			JP	CERO*AZERO	00334	60400	00337		
.	OC342			JP	CERO*ANEG	00335	60700	00337		
.	OC343			ENT	A*1*SKIP	00336	11100	00001		
.	OC344		CERO	ENT	A*0	00337	11000	0000C		
.	OC345		STORE	STR	A*(DAYINCRMNT)	00340	15030	00351		
.	OC346			ADD	A*(WHOLEYEAR)	00341	20030	01375		
.	OC347			ADD	A*24373000	00342	20030	03614		
.	OC350			ADD	A*L(OAY)	00343	20010	6315C		
.	OC351			STR	A*(JULIANOAY)	00344	15030	01376		
.	OC352			SUB	A*24381450	00345	21030	03615		
.	OC353			SUB	A*(DAYINCRMNT)	00346	21030	00351		
.	OC354			STR	A*(SAFE)	00347	15030	01411		
.	OC355			EXIT		00350	61010	00323		
.	OC356		DAYINCRMNT	O		00351	00000	0000C		
.	OC357		MUONTIME	ENTRY		00352	61000	0000C		
.	OC360			ENT	A*(CELTIME)	00353	11030	63133		
.	OC361			ADD	A*(OELTATEE)*APOS	00354	20630	63316		
.	OC362			JP	NEGTIME	00355	61000	00406		
.	OC363			ENT	B4*5760	00356	12400	0110C		
.	OC364		WORLDFAIR	RSH	AQ*300	00357	33000	0036C		
.	OC365			DIV	W(HOUR)	00360	23030	00766		
.	OC366			STR	Q*(TIME2)	00361	14030	0141C		
.	OC367			CL	Q*	00362	10000	0000C		
.	OC370			DIV	W(HOUR)	00363	23030	00766		
.	OC371			LSH	AQ*290	00364	70000	00035		

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CARDS	LI	IO LABEL	TA STATEMENT	LOC	F	JKR	Y	NOTES
.	00372		SEL CL*W(KEY)	00365	52030	C1013		
.	00373		STR A*W(P)	00366	15030	C1022		
.	00374		ENT A*W(TIME2)	00367	11030	C141C		
.	00375		LSH A*3	00370	C6000	C0003		
.	00376		ADD A*AEPPHEM+2+B4	00371	20004	C1414		
.	00377		STR A*L(RAAO)	00372	15010	C1402		
.	00400		ADD A*1	00373	20000	C0001		
.	00401		STR A*L(RAOIFAO)	00374	15010	C1405		
.	00402		ADD A*1	00375	20000	C0001		
.	00403		STR A*L(OECAO)	00376	15010	C1403		
.	00404		ADD A*1	00377	20000	C0001		
.	00405		STR A*L(OECOIFAO)	00400	15010	C1406		
.	00406		ADD A*1	00401	20000	C0001		
.	00407		STR A*L(OISTAO)	00402	15010	C1404		
.	00408		ADD A*1	00403	20000	C0001		
.	00409		STR A*L(OISTOIFAO)	00404	15010	C1407		
.	00410		EXIT	00405	61010	C0352		
.	00411		CL B4*	00406	12400	C0000		
.	00412	NEGTIME	SUR A*W(KEY)	00407	21030	C1013		
.	00413		JP WORLDSFAIR	00410	61000	C0357		
.	00414		ENTRY	00411	61000	C0000		
.	00415	STATUSCK	STR EPHEM*W(TAPSTAT)	00412	17670	C0524		
.	00416		ENT A*U(TAPSTAT)	00413	11020	C0524		
.	00417		RSH A*110	00414	C2000	C0013		
.	00418		STR A*W(TAPSTAT+1)	00415	15030	C0525		
.	00419		RPL Y+1*L(STATUSCK)	00416	36010	C0411		
.	00420		ENT B3*L(TAPSTAT+1)	00417	12310	C0525		
.	00421		RIL	00420	60000	C0000		
.	00422		JP STATACT+R3	00421	61003	C0422		
.	00423	STATACT	JP BUST	00422	61000	C0476		
.	00424		JP BUST	00423	61000	C0476		
.	00425		JP BUST	00424	61000	C0476		
.	00426		JP BUST	00425	61000	C0476		
.	00427		JP BUST	00426	61000	C0476		
.	00428		JP BUST	00427	61000	C0476		
.	00429		JP BUST	00428	61000	C0476		
.	00430		JP BUST	00429	61000	C0476		
.	00431		JP BUST	00430	61000	C0476		
.	00432		JP BUST	00431	61000	C0476		
.	00433		JP BUST	00432	61010	C0411		
.	00434		JP BUST	00433	61000	C0476		
.	00435		JP BUST	00434	61000	C0476		
.	00436		JP BUST	00435	61000	C0476		
.	00437		EXIT	00436	61000	C0442		
.	00438		JP BUST	00437	61000	C0476		
.	00439		JP BUST	00438	61000	C0476		
.	00440		JP BUST	00439	61000	C0476		
.	00441		JP BUST	00440	61000	C0476		
.	00442		JP ENDFILE	00441	61000	C0476		
.	00443		JP CANTFNO	00442	61000	C0476		
.	00444		JP RUST	00443	61000	C0476		
.	00445		JP BUST	00444	61000	C0476		
.	00446		JP BUST	00445	61000	C0476		
.	00447	CANTFNO	EX-FC	00446	61000	C0476		
.	00448		ENT B4*L(MUNTHPRINT)	00447	13670	C0765		
.	00449		ENT A*W(YEARPRINT+B4)	00448	12410	C0743		
.	00450		STR A*W(MOONATA2)	00449	11034	C1002		
.	00451		ENT B4*L(YEARMONTH)	00450	15030	C0546		
.	00452			00451	12410	63147		
.	00453			00452				

4 SEQ ERR SYNC 20
5 REMINDING 24
6 CHAR COUNT 30
7 ILLEGAL 34
10 40 NORMAL
11 REPEAT 44
12 SEQ ERR CCNT 50
13 ECF 54
14 EOT 60
15 NLNLSCH
16 ABN F C 70
17 INTERLOCK 74

FRACHTMAN*7/14/64

MOONTRACK

CARDS	LI	ID	LABEL	TA	STATEMENT	LOC	F	JK8	Y	NOTES
.	UC454			ENT	A*W(MONTHPR(NT+84)	00447	11034	00743		
.	UC455			RPL	A*Y*W(NODATA2)	00450	24030	00546		
.	UC456			CL	A*	00451	11000	0000C		
.	UC457			ENT	Q*L(BARKIER)	00452	10010	00473		
.	UC460			DIV	12	00453	23000	00012		
.	UC461			ADD	A*60	00454	20000	0006C		
.	UC462			STR	A*U(IMPERIAL)	00455	15020	01377		
.	UC463			CL	A*	00456	11000	0000C		
.	UC464			DIV	12	00457	23000	00012		
.	UC465			JP	ALBERT*AZERU	00460	60400	00462		
.	UC466			ADD	A*60	00461	20000	0006C		
.	UC467	ALBERT		LSH	A*6	00462	C6000	0C006		
.	UC470			ADD	A*U(IMPERIAL)	00463	20020	01377		
.	UC471			LSH	A*6	00464	C6000	00006		
.	UC472			ADD	A*3105000005	00465	20030	03616		
.	UC473			STR	A*W(NODATA3)	00466	15030	00552		
.	UC474			RJP	U(INTERCOM)	00467	65020	63426		
.	UC475			U-TAG	NODATA*0	00470	C0540	0C000		
.	UC476			JP	L(MOONINIT)	00471	61010	00002		
.	UC477	ENDFILE		RPL	Y+1*L(IMPERIAL)	00472	36010	01377		MCCN
.	UC500	BARRIER		SUB	A*12D	00473	21000	0C014		
.	UC501			JP	CANTFIND*AZERO	00474	60400	00442		
.	UC502			JP	TRYAGA(N	00475	61000	00034		
.	UC503	BUST		EX-FCT	EPHEM*W(REWINDNC)	00476	13670	00765		
.	UC504			ENT	A*L(TAPSTAT+1)	00477	11010	00525		
.	UC505			RSH	A*1	00500	C2000	00001		
.	UC506			ADD	A*60	00501	20000	0006C		
.	UC507			LSH	A*6	00502	C6000	0C006		
.	UC510			STR	A*L(TAPSTAT+2)	00503	15010	00526		
.	UC511			ENT	A*L(TAPSTAT+1)	00504	11010	00525		
.	UC512			SEL	CL*X77776	00505	52040	77776		
.	UC513			LSH	A*2	00506	C6000	00002		
.	UC514			ADD	A*60	00507	20000	0006C		
.	UC515			ADD	A*L(TAPSTAT+2)	00510	20010	00526		
.	UC516			STR	A*L(TAPEBUST1+3)	00511	15010	00522		
.	UC517			RJP	U(INTERCOM)	00512	65020	63426		
.	UC520			U-TAG	TAPEBUST*0	00513	C0515	0C00C		
.	UC521			JP	L(MOON(NIT)	00514	61010	00002		
.	UC522	TAPEBUST		FD	O*A	00515	C6050	50505		
.	UC523			-0	TAPEBUST1	00516	77777	00517		
.	UC524	TAPEBUST1		FD	O*II(C	00517	16161	61005		
.	UC525			FD	O*STATU	00520	30310	63132		
.	UC526			FD	2*S S1	00521	30050	53061		
.	UC527			-0		00522	C5050	50505		
.	UC530	TAPSTAT		+0		00523	77777	77777		
.	UC531			+0		00524	C0000	0C00C		
.	UC532			+0		00525	C0000	0C00C		
.	UC533	NEGDEC		JP	BEAVER*QNEG	00526	C0000	0C00C		
.	UC534			SUB	A*1	00527	60300	00264		
.						00530	21000	0C001		

MUONTRACK FRACHTMAN*7/14/64

CARDS	LI	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NOTES
.	UC535		EPHMA	JP	BEAVER	00531	61C00	CC264		
.	UC536		EPHMB	U-TAG	AEPPH+1910*AEPPH	00532	C1711	01412		
.	UC537		EPHMC	U-TAG	AEPPH+3830*AEPPH+1920	00533	C2211	01712		
.	UC540		EPHMC	U-TAG	AEPPH+5750*AEPPH+3840	00534	C2511	02212		
.	UC541		EPHMD	U-TAG	AEPPH+7670*AEPPH+5760	00535	C3011	02512		
.	UC542		EPHME	U-TAG	AEPPH+9590*AEPPH+7690	00536	C3311	03012		
.	UC543		EPHEMF	U-TAG	AEPPH+11510*AEPPH+9600	00537	C3611	03312		
.	UC544		NUOATA	FD	O*A	00540	C6050	50505		
.	UC545			-O	NOOATA1	00541	77777	00542		
.	UC546		NUOATA1	FD	O*MOON	00542	22242	42305		
.	UC547			FD	O*EPHME	00543	12251	51222		
.	UC550			FD	O*ERIS	00544	12271	63005		
.	UC551			FD	O*FOR	00545	13242	70505		
.	UC552		NUOATA2	FD	O*63/63	00546	66637	46663		
.	UC553			FD	O* NOT	00547	C5232	431C5		
.	UC554			FD	O*AMONG	00550	C6222	42314		
.	UC555			FD	O* FIRS	00551	C5131	6273C		
.	UC556		NUOATA3	FD	O*T	00552	31050	505C5		
.	UC557			FD	O*FILES	00553	13162	1123C		
.	UC560			-O		00554	77777	77777		
.	UC561		INITIALJD	FD	O*A	00555	C6050	50505		
.	UC562			U-TAG	INITIAL2*INITIAL1	00556	C0563	00557		
.	UC563		INITIAL1	FD	O*JULIA	00557	17322	11606		
.	UC564			FD	2*N OAY	00560	23051	10636		
.	UC565			-O		00561	C5050	505C5		
.	UC566		INITIAL2	FD	O*O	00562	77777	77777		
.	UC567			-O	INITIAL3	00563	11050	50505		
.	UC570		INITIAL3	O		00564	77777	00565		
.	UC571		INITIALDAT	FD	O*A	00565	C0000	C0C0C		
.	UC572		INITIAL10	U-TAG	INITIAL11*INITIAL10	00566	C6050	50505		
.	UC573			FD	3*OAY OF YEAR	00567	C0574	0057C		
.	UC574			-O		0057C	11063	60524		
.	UC575		INITIAL11	FD	O*O	00571	13053	61206		
.	UC576			-O	INITIAL12	00572	27C50	5C5C5		
.	UC577		INITIAL12	O		00573	77777	77777		
.	UC600		RGHTASC	FD	O*A	00574	11C50	505C5		
.	UC601			O	RA1	00575	77777	00576		
.	UC602			FD	O*O	00576	C0000	0C0C0		
.	UC603			FD	RA2	00577	C6050	5C5C5		
.	UC604			FD	O*A	00600	C0C00	C0615		
.	UC605			O	RA3	00601	11050	50505		
.	UC606			FD	O*O	00602	C0C00	CC621		
.	UC607			FD	RA4	00603	C6050	50505		
.	UC610			FD	O*A	00604	C0C00	CC622		
.	UC611			O	RA5	00605	11050	505C5		
.	UC612			FD	O*X2B23	00606	C0C00	CC624		
.	UC613			O	RA6	00607	C6050	5C5C5		
.				FD		0C61C	C0C00	CC625		
.				FD		00611	35620	76263		
.				O		0C612	C0C00	CC627		

SPURT OUTPUT NO. 210

FRACHTMAN*7/14/64

MOONTRACK

CARDS	LI	IO	LABEL	TA	STATEMENT	LOC	F	JKR	Y	NCIES
.	0C614			FD	0*A	00613	C6050	50505		
.	UC615			-0	RA7	00614	77777	00630		
.	UC616	RA1		FD	3*RIGHT ASC	00615	27161	41531		
						00616	C5063	01005		
						00617	C5050	50505		
.	0C617			-0		00620	77777	77777		
.	UC620	RA2		0		00621	C0000	00000		
.	0C621	RA3		1505		00622	C0000	01505		
.	0C622			-0		00623	77777	77777		
.	UC623	RA4		U		00624	C0000	00000		
.	UC624	RA5		2205		00625	C0000	02205		
.	UC625			-0		00626	77777	77777		
.	UC626	RA6		0		00627	C0000	00000		
.	0C627	RA7		30		00630	C0000	00030		
.	UC630			-0		00631	77777	77777		
.	UC631	DLN		FD	0*A	00632	C6050	50505		
.	UC632			U	DLN1	00633	C0000	00650		
.	0C633			FC	0*0	00634	11050	50505		
.	UC634			0	DLN2	00635	C0000	00654		
.	0C635			FD	0*A	00636	C6050	50505		
.	UC636			0	DLN3	00637	C0000	00655		
.	0C637			FD	0*0	00640	11050	50505		
.	UC640			0	DLN4	00641	C0000	00657		
.	0C641			FD	0*A	00642	C6050	50505		
.	UC642			U	DLN5	00643	C0000	00660		
.	0C643			FD	0*X2823	00644	35620	76263		
.	UC644			0	DLN6	00645	C0000	00662		
.	0C645			FD	0*A	00646	C6050	50505		
.	UC646			-0	DLN7	00647	77777	00663		
.	UC647	DLN1		FD	3*DECLINATION	00650	11121	02116		
						00651	23063	11624		
						00652	23050	50505		
						00653	77777	77777		
.	0C650			-0		00654	C0000	00000		
.	UC651	DLN2		U		00655	C0000	01105		
.	0C652	DLN3		1105		00656	77777	77777		
.	UC653			-0		00657	C0000	00000		
.	UC654	DLN4		0		00660	C0000	07205		
.	0C655	DLN5		7205		00661	77777	77777		
.	UC656			-U		00662	C0000	00000		
.	0C657	DLN6		0		00663	C0000	00052		
.	UC660	DLN7		52		00664	77777	77777		
.	0C661			-U		00665	C6050	50505		
.	UC662	GMT		FD	0*A	00666	C0000	00703		
.	UC663			0	GMT1	00667	11050	50505		
.	0C664			FD	0*0	00670	C0000	00710		
.	UC665			0	GMT2	00671	C6050	50505		
.	0C666			FD	0*A	00672	C0000	00710		
.	UC667			U	GMT3	00673	11050	50505		
.	0C670			FD	0*0	00674	C0000	00712		
.	UC671			U	GMT4					

MOONTRACK FRACHTMAN*7/14/64

CAROS	L1	IO	LABEL	TA	STATEMENT	LOC	F	JKB	Y	NCIES
.	OC672				F0 O*A	00675	C6050	50505		
.	OC673				0 GMT5	00676	C0000	C0713		
.	OC674				F0 O*X2823	00677	35620	76263		
.	OC675				0 GMT6	00700	C0000	C0715		
.	OC676				F0 O*A	00701	C6050	50505		
.	OC677				-0 GMT7	00702	77777	C0716		
.	OC700		GMT1		F0 3*UNIVERSAL TIME	00703	32231	63312		
						00704	27300	62105		
						00705	31162	21205		
						00706	77777	77777		
.	OC701				-0	00707	C0000	C000C		
.	OC702		GMT2		0	00710	C0000	C1505		
.	OC703		GMT3		1505	00711	77777	77777		
.	OC704				-0	00712	C0000	C000C		
.	OC705		GMT4		0	00713	C0000	C2205		
.	OC706		GMT5		2205	00714	77777	77777		
.	OC707				-0	00715	C0000	C000C		
.	OC710		GMT6		0	00716	C0000	C003C		
.	OC711		GMT7		30	00717	77777	77777		
.	OC712				-0	00720	C6050	50505		
.	OC713		INITIAL01S		F0 U*A	00721	C0726	00722		
.	OC714				U-TAG INITIAL17*INITIAL16	00722	11163	03106		
.	OC715		INITIAL16		F0 O*OISTA	00723	23101	20505		
.	OC716				F0 O*NCE	00724	12052	70505		
.	OC717				F0 O*E R	00725	77777	77777		
.	OC720				-0	00726	35660	76262		
.	OC721		INITIAL17		F0 O*X6822	00727	77777	0073C		
.	OC722				-0 INITIAL18	00730	C0000	C000C		
.	OC723		INITIAL18		0	00731	C6050	50505		
.	OC724		INITIAL800		F0 O*A	00732	C0737	00733		
.	OC725				U-TAG INITIAL20*INITIAL19	00733	24071	7121C		
.	OC726		INITIAL19		F0 3*OBJECT	00734	31050	50505		
						00735	C5050	5C505		
						00736	77777	77777		
.	OC727				-0	00737	C6050	5C505		
.	OC730		INITIAL20		F0 O*A	00740	77777	C0741		
.	OC731				-0 INITIAL21	00741	22242	4230C		
.	OC732		INITIAL21		2224242300	00742	77777	77777		
.	OC733				-0	00743	C0000	C000C		
.	OC734		MONTHPRINT		0	00744	C0610	C000C		
.	OC735				0061000000	00745	C0620	C000C		
.	OC736				0062000000	00746	C0630	C000C		
.	OC737				0063000000	00747	C0640	C000C		
.	OC740				0064000000	00750	C0650	C000C		
.	OC741				0065000000	00751	C0660	C000C		
.	OC742				0066000000	00752	C0670	C000C		
.	OC743				0067000000	00753	C0700	C000C		
.	OC744				0070000000	00754	C0710	C000C		
.	OC745				0071000000	00755	61600	C000C		
.	OC746				6160000000	00756	61610	C000C		
.	OC747				6161000000					

FC 0 MOCN

MOONTRACK FRACHTMAN*7/14/64

CARDS	L1 ID LABEL	TA STATEMENT	LUC	F JK8 Y	NOTES
.	OC750	6162000000	00757	61620 CC00C	
.	OC751 HALFOAY	1000000000	00760	10000 CC00C	
.	OC752 REVSRAOIAN	2427630154	00761	24276 30154	DEC
.	OC753 SHIBIN	5600000002	00762	56000 CC002	G.63661977B29
.	OC754 IGNORE	6000000000	00763	60000 CC00C	
.	OC755 INTERRUPT	RJP STATUSCK	00764	65000 00411	NO INT
.	OC756 REMINONO	2010000002	00765	20100 CC002	1 B
.	OC757 HOUR	0052525253	00766	C0525 25253	DEC 1118481180
.	OC760 SRAD	3266677126	00767	32666 77126	DEC 13750.987815
.	OC761 HRAD	1030124435	00770	10301 24435	20C/PI
.	OC762 MINSRAD	2167643241	00771	21676 43241	/12
.	OC763 HDAY	1252525250	00772	12525 25250	DEC 8PI/720
.	OC764 MDAY	2660266026	00773	26602 66026	24 832
.	OC765 SDAY	2506000000	00774	25060 CC00C	DEC 10/1440
.	OC766 SECSRAD	2304045527	00775	23040 45527	DEC 86400.000812
.	OC767 SARAD	3113343172	00776	31133 43172	DEC .59573905829
.	OC770 ERNSEC	0	00777	C0000 CC00C	13PI/43200
.	OC771 RHRSEC	2215053171	01000	22150 53171	DEC 206264.81811
.	OC772 TWOPIE	3110375523	01001	31103 75523	DEC 800/PI
.	OC773 YEARPRINT	0000746661	01002	C0007 46661	DEC .568888889829
.	OC774	0000746662	01003	C0007 46662	DEC 11/3600
.	OC775	0000746663	01004	C0007 46663	DEC 6.2831853826
.	OC776	0000746664	01005	C0007 46664	
.	OC777	0000746665	01006	C0007 46665	
.	01000	0000746666	01007	C0007 46666	
.	01001	0000746667	01010	C0007 46667	
.	01002	0000746670	01011	C0007 46670	
.	01003	0000746671	01012	C0007 46671	
.	01004 KEY	4000000000	01013	40000 CC00C	
.	01005 FIRSTOIFF	0	01014	C0000 CC00C	
.	01006 BETA	0	01015	C0000 CC00C	
.	01007 GAMMA	0	01016	C0000 CC00C	
.	01010 DELTA	0	01017	C0000 CC00C	
.	01011 EPSILON	0	01020	C0000 CC00C	
.	01012 FUNCTION	0	01021	C0000 CC00C	
.	01013 P	0	01022	C0000 CC00C	
.	01014 HALF	2000000000	01023	20000 CC00C	
.	01015 DMINB	0	01024	C0000 CC00C	
.	01016 DMIN2CPLB	0	01025	C0000 CC00C	
.	01017 EP2RM2DMA	0	01026	C0000 CC00C	
.	01020 BESSCL	0	01027	C0000 CC00C	
.	01021	0	01030	C0000 CC00C	

FRACHTMAN*7/14/64

CARDS	LL	ID	L	REL	TA	STATEMENT	MOONTRACK	LCC	F	JKR	Y	NOTES
.	01022				U			01031	C0C00	C0C00	C0C00	
.	01023				0			01032	C0C00	C0C00	C0C00	
.	01024				U			01033	C0C00	C0C00	C0C00	
.	01025				0			01034	C0C00	C0C00	C0C00	
.	01026				U			01035	C0C00	C0C00	C0C00	
.	01027				1252525252			01036	12525	25252		
.	01030				0525252525			01037	C5252	52525		
.	01031				0			01040	C0C00	C0C00	C0C00	
.	01032				0			01041	C0C00	C0C00	C0C00	
.	01033				0			01042	C0C00	C0C00	C0C00	
.	01034				0			01043	C0C00	C0C00	C0C00	
.	01035				0			01044	C0C00	C0C00	C0C00	
.	01036				0			01045	C0C00	C0C00	C0C00	
.	01037				0			01046	C0C00	C0C00	C0C00	
.	01040				0			01047	C0C00	C0C00	C0C00	
.	01041				ENTRY			01050	61000	00000		
.	01042				ENT Q*-20			01051	10C40	77757		
.	01043				RPL Y+Q*L(SETINTAO)			01052	34010	C1047		
.	01044				ENT B3*L(SETINTAD)			01053	12310	C1047		
.	01045				ENT A*(U+R3)			01054	11033	00000		
.	01046				STR A*(FIRSTOIFF)			01055	15030	C1014		
.	01047				ENT B3*10+R3			01056	12303	C001C		
.	01050				ENT A*(U+R3)			01057	11033	C0C00		
.	01051				STR A*(BETA)			01060	15030	C1015		
.	01052				ENT R3*10+R3			01061	12303	C001C		
.	01053				ENT A*(U+R3)			01062	11033	C0C00		
.	01054				STR A*(GAMMA)			01063	15C30	C1016		
.	01055				ENT R3*10+R3			01064	12303	C001C		
.	01056				ENT A*(U+R3)			01065	11033	C0C00		
.	01057				STR A*(DELTA)			01066	15C30	C1017		
.	01060				ENT R3*10+R3			01067	12303	C001C		
.	01061				ENT A*(U+R3)			01070	11033	C0C00		
.	01062				STR A*(EPSILON)			01071	15030	C102C		
.	01063				ENT A*(DELTA)			01072	11030	C1017		
.	01064				SUB A*(BETA)			01073	21C30	C1015		
.	01065				STR A*(OMINR)			01074	15030	C1024		
.	01066				ACC A*(UMINB)			01075	20C30	C1024		
.	01067				STR A*(BESSEL)			01076	15C30	C1027		
.	01070				ENT A*(DELTA)			01077	11C30	C1017		
.	01071				ADD A*(BETA)			01100	20C30	C1015		
.	01072				SUB A*(GAMMA)			01101	21C30	C1016		
.	01073				SUB A*(GAMMA)			01102	21C30	C1016		
.	01074				STR A*(OMIN2CPLR)			01103	15C30	C1025		
.	01075				ENT A*(EPSILON)			01104	11030	C102C		
.	01076				SUB A*(FIRSTOIFF)			01105	21C30	C1014		
.	01077				SUB A*(BESSEL)			01106	21C30	C1027		
.	01100				STR A*(EP2BM2DMA)			01107	15C30	C1026		
.	01101				ENT Q*(P)			01110	10C30	C1022		
.	01102				MUL W(GAMMA)			01111	22C30	C1016		
.	01103				LSH AO*1			01112	C7000	C0C01		

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MOONTRACK

CARDS	LI	ID	LABCL	TA	STATEMENT	LOC	F	JK8	Y	NOTES
.	01104			STR	A*(W(BESSEL*1))	01113	15030	C1030		
.	01105			STR	A*(W(BESSEL)*APOS	01114	15630	C1027		
.	01106			JP	NEGBESS1	01115	61000	C135C		
.	01107			LSH	AQ*290	01116	70000	00035		
.	01110			SEL	CL*(W(KEY)	01117	52030	C1013		
.	01111	STOR1		STR	A*(W(FBESSEL)	01120	15030	C1042		
.	01112			STR	A*(W(FBESSEL*1)	01121	15030	C1043		
.	01113			ENT	Q*(W(P)	01122	10030	C1022		
.	01114			MUL	W(P)	01123	22030	C1022		
.	01115			ENT	B5*1	01124	12500	00001		
.	01116			RJP	LEFRNDUFF	01125	65000	C1364		
.	01117			SUB	A*(W(P)	01126	21030	C1022		
.	01120			STR	A*(W(PSQMP)	01127	15030	C1034		
.	01121			RSH	AQ*300	01130	70000	00036		
.	01122			MUL	W(DMINB)	01131	22030	C1024		
.	01123			RSH	AQ*1	01132	70000	00001		
.	01124			STR	A*(W(BESSEL*2)*APOS	01133	15630	C1031		
.	01125			JP	NEGBESS2	01134	61000	C1353		
.	01126			LSH	AQ*290	01135	70000	00035		
.	01127			SEL	CL*(W(KEY)	01136	52030	C1013		
.	01130	STOR2		STR	A*(W(FBESSEL*2)	01137	15030	C1044		
.	01131			ENT	A*(W(PSQMP)	01140	11030	C1034		
.	01132			RSH	AQ*300	01141	70000	00036		
.	01133			DIV	6*AZERO	01142	23400	00006		
.	01134			JP	REMAINDER	01143	61000	C125C		
.	01135	L(NCOLN		STR	Q*(W(PSQMP6)	01144	14030	C1035		
.	01136			ENT	Q*(W(P)	01145	10030	C1022		
.	01137			SUB	Q*(W(HALF)	01146	27030	C1023		
.	01140			MUL	W(PSQMP6)	01147	22030	C1035		
.	01141			RJP	LEFRNDUFF	01150	65000	C1364		
.	01142			RSH	AQ*300	01151	70000	00036		
.	01143			MUL	W(DMIN2CPLB)	01152	22030	C1025		
.	01144			LSH	AQ*1	01153	70000	00001		
.	01145			STR	A*(W(BESSEL*3)*APOS	01154	15630	C1032		
.	01146			JP	NEGBESS3	01155	61000	C1356		
.	01147			LSH	AQ*290	01156	70000	00035		
.	01150			SEL	CL*(W(KEY)	01157	52030	C1013		
.	01151	STOR3		STR	A*(W(FBESSEL*3)	01160	15030	C1045		
.	01152			ENT	Q*(W(PSQMP6)	01161	10030	C1035		
.	01153			SUB	Q*(W(THIRD)	01162	27030	C1036		
.	01154			MUL	W(PSQMP)	01163	22030	C1034		
.	01155			RJP	LEFRNDUFF	01164	65000	C1364		
.	01156			RSH	AQ*300	01165	70000	00036		
.	01157			MUL	W(EP28M2DMA)	01166	22030	C1026		
.	01160			RSH	AQ*2	01167	70000	00002		
.	01161			STR	A*(W(BESSEL*4)*APOS	01170	15630	C1033		
.	01162			JP	NEGBESS4	01171	61000	C1361		
.	01163			LSH	AQ*290	01172	70000	00035		
.	01164			SEL	CL*(W(KEY)	01173	52030	C1013		
.	01165	STOR4		STR	A*(W(FBESSEL*4)	01174	15030	C1046		

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CARDS	L1	ID	LABEL	TA	STATEMENT	LUC	F	JKR	Y	NOTES
.	01166			ENT	A*W(FBESSEL)	01175		11C30	C1042	
.	01167			SEL	CP*W(FBESSEL+2)	01176		51C30	C1044	
.	01170			JP	FLOTEST1*APOS	01177		60600	C1262	
.	01171	NUFLO1		ENT	Q*W(BESSEL+2)	01200		10030	C1031	
.	01172	F(X1)		RPL	Y+Q*W(BESSEL)	01201		34C30	C1027	
.	01173			ENT	A*W(FBESSEL+2)	01202		11030	C1044	
.	01174			RPL	A+Y*W(FBESSEL)	01203		24C30	C1042	
.	01175			SEL	CP*W(FBESSEL+3)	01204		51C30	C1045	
.	01176			JP	FLOTEST2*APOS	01205		60600	C1304	
.	01177	NUFLO2		ENT	Q*W(BESSEL+3)	01206		10030	C1032	
.	01200	F(X2)		RPL	Y+Q*W(BESSEL)	01207		34C30	C1027	
.	01201			ENT	A*W(FBESSEL+3)	01210		11030	C1045	
.	01202			RPL	A+Y*W(FBESSEL)	01211		24C30	C1042	
.	01203			SEL	CP*W(FBESSEL+4)	01212		51030	C1046	
.	01204			JP	FLOTEST3*APOS	01213		60600	C1326	
.	01205	NUFLO3		ENT	Q*W(BESSEL+4)	01214		10030	C1033	
.	01206	F1X3		RPL	Y+Q*W(BESSEL)	01215		34C30	C1027	
.	01207			ENT	A*W(FBESSEL+4)	01216		11030	C1046	
.	01210			RPL	A+Y*W(FBESSEL)	01217		24C30	C1042	
.	01211			ENT	Q*W(P)	01220		10030	C1022	
.	01212			SUB	Q*W(HALF)	01221		27030	C1023	
.	01213			MUL	W(DMINB)	01222		22030	C1024	
.	01214			CL	B5*	01223		12500	C000C	
.	01215			RJP	LEFRNOOFF	01224		65000	C1364	
.	01216			STR	A*W(KENNEOY)	01225		15030	C104C	
.	01217			ENT	Q*W(PSOMP)	01226		10030	C1034	
.	01220			ADD	Q*W(SIXTH)	01227		26030	C1037	
.	01221			MUL	W(DMIN2CPLB)	01230		22C30	C1025	
.	01222			RJP	LEFRNOOFF	01231		65000	C1364	
.	01223			ADD	A*W(KENNEOY)	01232		20030	C104C	
.	01224			ADD	A*W(GAMMA)	01233		20030	C1016	
.	01225			STR	A*W(NUMOERIV)	01234		15030	C1041	
.	01226			ENT	A*W(FBESSEL)*APOS	01235		11630	C1042	
.	01227			JP	MINUS	01236		61000	C1244	
.	01230			LSH	A*1*ANEG	01237		C6700	C0001	
.	01231			ENT	A*W(BESSEL)*SKIP	01240		11130	C1027	
.	01232			RPL	Y+1*W(BESSEL)	01241		36030	C1027	
.	01233	SUM		ADD	A*W(U+94)	01242		20034	C000C	
.	01234			EXIT		01243		61010	C105C	
.	01235	M(NUS		LSH	A*1*APOS	01244		C6600	C0001	
.	01236			ENT	A*W(BESSEL)*SKIP	01245		11130	C1027	
.	01237			RPL	Y-1*W(BESSEL)	01246		37030	C1027	
.	01240			JP	SUM	01247		61000	C1242	
.	01241	REMAINDER		JP	CIV(L*QPOS	01250		60200	C1256	
.	01242			STR	A*A	01251		15040	C000C	
.	01243			SUB	A*3*APOS	01252		21600	C0003	
.	01244			JP	LINCOLN	01253		61000	C1144	
.	01245			SUB	Q*1	01254		27000	C0001	
.	01246			JP	LINCOLN	01255		61000	C1144	
.	01247	CIVIL		SUB	A*3*APOS	01256		21600	C0003	

SPURT OUTPUT NO. 21C

FRACHTMAN*7/14/64

MOONTRACK

TA STATEMENT

LI ID LABEL

CARDS

NCIES

F JK8 Y

LOC

01250	JP	LINCOLN	01257	61000	C1144
01251	ADD	Q*1	01260	26000	CC001
01252	JP	LINCOLN	01261	61000	C1144
01253	ENT	A*(FBESSEL)*ANEG	01262	11730	C1042
01254	ADD	A*(FBESSEL+2)*SKIP	01263	20130	C1044
01255	JP	BOTHNEG1	01264	61000	C1274
01256	JP	NDFLO1*APOS	01265	60600	C120C
01257	SEL	CL*(KEY)	01266	52030	C1013
01260	STR	A*(FBESSEL)	01267	15030	C1042
01261	ENT	Q*(BESSEL+2)	01270	10030	C1031
01262	ADD	Q*1	01271	26000	CC001
01263	RPL	Y+Q*(BESSEL)	01272	34030	C1027
01264	JP	FIX1+3	01273	61000	C1204
01265	ADD	A*(FBESSEL+2)	01274	20030	C1044
01266	JP	NDFLO1*ANEG	01275	60700	C120C
01267	SEL	SET*(KEY)	01276	50030	C1013
01270	STR	A*(FBESSEL)	01277	15030	C1042
01271	ENT	Q*(BESSEL+2)	01300	10030	C1031
01272	SUB	Q*1	01301	27000	CC001
01273	RPL	Y+Q*(BESSEL)	01302	34030	C1027
01274	JP	FIX1+3	01303	61000	C1204
01275	ENT	A*(FBESSEL)*ANEG	01304	11730	C1042
01276	ADD	A*(FBESSEL+3)*SKIP	01305	20130	C1045
01277	JP	BOTHNEG2	01306	61000	C1316
01300	JP	NDFLO2*APOS	01307	60600	C1206
01301	SEL	CL*(KEY)	01310	52030	C1013
01302	STR	A*(FBESSEL)	01311	15030	C1042
01303	ENT	Q*(BESSEL+3)	01312	10030	C1032
01304	ADD	Q*1	01313	26000	CC001
01305	RPL	Y+Q*(BESSEL)	01314	34030	C1027
01306	JP	FIX2+3	01315	61000	C1212
01307	ADD	A*(FBESSEL+3)	01316	20030	C1045
01310	JP	NDFLO2*ANEG	01317	60700	C1206
01311	SEL	SET*(KEY)	01320	50030	C1013
01312	STR	A*(FBESSEL)	01321	15030	C1042
01313	ENT	Q*(BESSEL+3)	01322	10030	C1032
01314	SUB	Q*1	01323	27000	CC001
01315	RPL	Y+Q*(BESSEL)	01324	34030	C1027
01316	JP	FIX2+3	01325	61000	C1212
01317	ENT	A*(FBESSEL)*ANEG	01326	11730	C1042
01320	ADD	A*(FBESSEL+4)*SKIP	01327	20130	C1046
01321	JP	BOTHNEG3	01330	61000	C134C
01322	JP	NDFLO3*APOS	01331	60600	C1214
01323	SEL	CL*(KEY)	01332	52030	C1013
01324	STR	A*(FBESSEL)	01333	15030	C1042
01325	ENT	Q*(BESSEL+4)	01334	10030	C1033
01326	ADD	Q*1	01335	26000	CC001
01327	RPL	Y+Q*(BESSEL)	01336	34030	C1027
01330	JP	FIX3+3	01337	61000	C122C
01331	ADD	A*(FBESSEL+4)	01340	20030	C1046

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MOONTRACK

CARDS	LL	ID	LABEL	TA STATEMENT	LUC	F	JKB	Y	NOTES
.	01332			JP NOFL03*ANEG	01341	60700	C1214		
.	01333			SEL SET*W(KEV)	01342	50030	C1013		
.	01334			STR A*W(FBESSEL)	01343	15030	C1042		
.	01335			ENT Q*W(BESSEL+4)	01344	10030	C1033		
.	01336			SUB Q*1	01345	27000	CC001		
.	01337			RPL Y+Q*W(BESSEL)	01346	34030	C1027		
.	01340			JP FIX3+3	01347	61000	C1220		
.	01341	NEGRESS1		LSH AQ*290	01350	70000	CC035		
.	01342			SEL SET*W(KEV)	01351	50030	C1013		
.	01343			JP STOR1	01352	61000	C1120		
.	01344	NEGRESS2		LSH AQ*290	01353	70000	CC035		
.	01345			SEL SET*W(KEV)	01354	50030	C1013		
.	01346			JP STOR2	01355	61000	C1137		
.	01347	NEGRESS3		LSH AQ*290	01356	70000	CC035		
.	01350			SEL SET*W(KEV)	01357	50030	C1013		
.	01351			JP STOR3	01360	61000	C1160		
.	01352	NEGRESS4		LSH AQ*290	01361	70000	CC035		
.	01353			SEL SET*W(KEV)	01362	50030	C1013		
.	01354			JP STOR4	01363	61000	C1174		
.	01355	LEFRNDOFF		ENTRY	01364	61000	CC000		
.	01356			JP MIKE*ANEG	01365	60700	C1371		
.	01357			LSH AQ*85*QPOS	01366	72050	CC000		
.	01360			ADD A*1	01367	20000	CC001		
.	01361			EXIT	01370	61010	C1364		
.	01362	MIKE		LSH AQ*85*QNEG	01371	73050	CC000		
.	01363			SUB A*1	01372	21000	CC001		
.	01364			EXIT	01373	61010	C1364		
.	01365	YRREMAIN		0	01374	60000	CC000		
.	01366	WHOLEYEAR		0	01375	60000	CC000		
.	01367	JULIANDAY		0	01376	60000	CC000		
.	01370	IMPERIAL		0	01377	60000	CC000		
.	01371	TAPEBLOCK		0	01400	60000	CC000		
.	01372	TAPESEARCH		0	01401	60000	CC000		
.	01373	KAAD		0	01402	60000	CC000		
.	01374	OECAD		0	01403	60000	CC000		
.	01375	OISTAD		0	01404	60000	CC000		
.	01376	RADIFAD		0	01405	60000	CC000		
.	01377	DECOIFAD		0	01406	60000	CC000		
.	01400	DISTDIFAD		0	01407	60000	CC000		
.	01401	TIME2		0	01410	60000	CC000		
.	01402	SAFE		0	01411	60000	CC000		
.	01403	AEPHEM		RESERVE 11510	01412	60000	CC000		
.	01404	LASTERPHM		0	03611	60000	CC000		
.	01405			RESERVE 1	03612	60000	CC000		
.					03613	CC014	77775		
.					03614	CC012	30264		
.					03615	CC012	32001		
.					03616	31050	CC005		

ENTER WITH B5 SET TO SHIFTS

FRACHTMAN*7/14/64

MOONTRACK

LABEL	LOC	LABEL	LOC	LABEL	LOC
ID2CELCOR	63001	ID2ENTPNT	63411	ID2RACCOR	63051
ID2RADIO	63441	ID2RECRD	63211	ID2SYSENT	77577
ID2SYSNAM	77677	ID2SYSPAR	63311	ID2TIME	63131
ID3RADIO	63776	ID4RADIO	63777	ID5RADIO	64776
ID6RADIO	64777	ID7RADIO	65776	ID8RADIO	65777
ID9RADIO	66776	IGNDRE	00763	IMPERIAL	01377
INAZIMAD0	63446	INELEVAD0	63447	INITIAL1	00557
INITIAL10	00570	INITIAL11	00574	INITIAL12	00576
INITIAL16	00722	INITIAL17	00726	INITIAL18	00730
INITIAL19	00733	INITIAL2	00563	INITIAL2C	00737
INITIAL21	00741	INITIAL3	00565	INITIALRCD	00731
INITIALDAT	00566	INITIALDIS	00720	INITIALJC	00555
INTER	63413	INTERAZIM	7200C	INTERCOM	63426
INTERDPP	74000	INTERLEV	7300C	INTERPCL	01050
INTERRANGE	76777	INTERUPT	00764	JULIANDAY	01376
KENNEDY	01040	KEY	01013	LONGITUDE	63320
LASTEPHEM	03611	LEFRNDOFF	01364	LESSCNE	00321
LINGDLN	01144	LUNAR	00100	MODNCCNT	00232
MOONINIT	00002	MOONTIME	00352	MOCSE	00245
MONITAPE	00055	MONTHPRINT	00743	MAINSWITCH	63334
MCPFILLER	71000	MCPGM	63412	MDAY	00773
MIKE	01371	MINREG	63152	MINSRAC	00771
MINUS	01244	NODATA	00540	NCDATA1	00542
NODATA2	00546	NODATA3	00552	NCFLC1	01200
NDFLO2	01206	NDFLO3	01214	NORMAL	00102
NEGRESS1	01350	NEGRESS2	01353	NEGRESS3	01356
NEGRESS4	01361	NEGDEC	00527	NEGTIME	00406
NUMDERIV	01041	P	01022	POLE	63324
PLANP	63434	PRINT	00212	PRLOG	63423
PSQMP	01034	PSQMP6	01035	RA	63002
RA1	00615	RA2	00621	RA3	00622
RA4	00624	RA5	00625	RA6	00627
RA7	00630	RAAD	01402	RADUT	63007
RADARMOOE	63312	RADIOMETER	63102	RADIFAC	01405
RADIUS	63006	RADIUSOOT	63011	RANGE	63052
RANGEOUT	70777	RANGEADD	63445	RANGEDOT	63062
RDIMR	63430	RDXXX	63433	RECAZIM	67000
RECELEV	70000	RECFILE	63212	RECR	63415
REMAINDER	01250	REVSRAOTIAN	00761	REWINDNO	00765
RHTASC	00577	RHRSEC	01000	SAFE	01411
SARAD	00776	SAZIM	63055	SECLTIME	63134
SDAY	00774	SDEC	63005	SEAPCRT	00304
SECONDS	63140	SECSRAD	00775	SELEV	63056
SETINTAD	01047	SIDERTIME	63012	SINCRIENT	63064
SINAZEL	63066	SIXTH	01037	SKIP	63331
SKA	63004	SRAD	00767	SRACTIME	63136
SRHIBIN	00762	STOR1	0112C	STCR2	01137
STUR3	01160	STOR4	01174	STCRE	00340
STATACT	00422	STATUSCK	00411	SUM	01242
SYSTEMIES	77600	SYSNAMCS	7770C	SYSTAT1	63313
SYSTAT2	63314	SYSTATD	63315	TAPERBLOCK	01400


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..... SPU RT CLUTPUT NO. 211 .....
MOONTRACK FRACHTMAN*7/14/64
  LABEL      LOC      LABEL      LOC      LABEL      LOC
TAPEBUST     00515    TAPEBUST1    00517    TAPEINPUT    00035
TAPESEARCH   01401    TAPSTAT     00524    THIRD        01036
TIME2        01410    TIMEMODE    63103    TIMEP        63435
TRUERANGE    63063    TRUETIME    63132    TRYAGAIN     00034
TWOLESS      00317    TWOPIE      01001    VIZDEC1      63014
VIZDEC2      63016    VIZRA1      63013    VIZRA2       63015
WORLOSFAIR   00357    WFORD       63432    WFACD        63450
WFFREQ       63333    WHOLEYEAR   01375    YEARMONTH    63147
YEARPRINT    01002    YRREMAIN    01374    YRTRAN       63327
ZTRAN

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FRACHTMAN*7/14/64

MOUNTRACK

LABEL	LOC	LABEL	LOC	LABEL	LOC
HENRY	00000	MODNINIT	00002	ERASE	00011
TRYAGAIN	00034	TAPEINPUT	00035	MONITAPE	00055
LUNAR	00100	NORMAL	00102	PRINT	00212
AIRPORT	00230	MOONCONT	00232	HARVARD	00235
MOUSE	00245	BEAVER	00264	SEAPORT	00304
FLATNEG	00305	TWOLESS	00317	LESSONE	00321
DAYFIND	00323	CERO	00337	STORE	00340
DAYINCRMNT	00351	MOONTIME	00352	WORLDSFAIR	00357
NEGTIME	00406	STATUSCK	00411	STACT	00422
CANTFIND	00442	ALBERT	00462	ENDFILE	00472
BARRIER	00473	BUST	00476	TAPEBUST	00515
TAPEBUST1	00517	TAPSTAT	00524	NEGDEC	00527
EPHEMA	00532	EPHEMB	00533	EPHEMC	00534
EPHEM0	00535	EPHEME	00536	EPHEMF	00537
NODATA	00540	NODATA1	00542	NODATA2	00546
NODATA3	00552	INITIALJ0	00555	INITIAL1	00557
INITIAL2	00563	INITIAL3	00565	INITIALDAT	00566
INITIAL10	00570	INITIAL11	00574	INITIAL12	00576
RGHTASC	00577	RA1	00615	RA2	00621
RA3	00622	RA4	00624	RA5	00625
RA6	00627	RA7	00630	DLN	00632
DLN1	00650	DLN2	00654	DLN3	00655
DLN4	00657	DLN5	00660	DLN6	00662
DLN7	00663	GMT	00665	GMT1	00703
GMT2	00707	GMT3	00710	GMT4	00712
GMT5	00713	GMT6	00715	GMT7	00716
INITIALDIS	00720	INITIAL16	00722	INITIAL17	00726
INITIAL18	00730	INITIAL800	00731	INITIAL19	00733
INITIAL20	00737	INITIAL21	00741	MCNTHPRINT	00743
HALFDAY	00760	REVSADIAN	00761	SRHIBIN	00762
IGNORE	00763	INTERUPT	00764	REWINDNO	00765
HOOR	00766	SRAD	00767	HRAC	00770
MINSRAD	00771	HOAY	00772	MDAY	00773
SDAY	00774	SECSRAD	00775	SARAD	00776
ERNMSEC	00777	RHRSEC	01000	TWOPIE	01001
YEARPRINT	01002	KEY	01013	FIRSTCIFF	01014
BETA	01015	GAMMA	01016	DELTA	01017
EPSILON	01020	FUNCTION	01021	P	01022
HALF	01023	DMINB	01024	DMIN2CPL8	01025
EP28M2DMA	01026	BESSEL	01027	PSQMP	01034
PSQMP6	01035	THIRD	01036	SIXTH	01037
KENNEDY	01040	NUMBERIV	01041	FBESSEL	01042
SETINIAD	01047	INTERPOL	01050	STDR1	01120
STOR2	01137	LINCOLN	01144	STCR3	01160
STOR4	01174	NOFLO1	01200	FIX1	01201
NOFLO2	01206	FIX2	01207	ACFLC3	01214
FIX3	01215	SUM	01242	MINUS	01244
REMAINDER	01250	CIVIL	01256	FLOTTEST1	01262
ROTNEG1	01274	FLUTEST2	01304	BCTHNEG2	01316
FLOTTEST3	01326	ROTNEG3	01340	NEGBESS1	01350
NEGBESS2	01353	NEGBESS3	01356	NEGBESS4	01361

..... SPURT CUTPUT NO. 212			FRACHTMAN#7/14/64		
MOUNTRACK					
LABEL	LOC	LABEL	LOC	LABEL	LOC
LEFRNDOFF	01364	MIKE	01371	YRREMAIN	01374
WHOLEYEAR	01375	JULIANDAY	01376	IMPERIAL	01377
TAPEBLUCK	01400	TAPESEARCH	01401	RAAD	01402
DECAD	01403	DISTAD	01404	RADIFAD	01405
DECOIFAD	01406	DISTOIFAD	01407	TIME2	01410
SAFE	01411	AEPHEM	01412	LASTEPHEM	03611
A\$\$\$\$1111	03613	A\$\$\$\$1112	03614	A\$\$\$\$1113	03615
A\$\$\$\$1114	03616	ID1CELCOR	63000	ID2CELCOR	63001
RA	63002	DEC	63003	SRA	63004
SDEC	63005	RADIUS	63006	RADOT	63007
DECODET	63010	RADIUSOOT	63011	SIDERTIME	63012
VIZRA1	63013	VIZDEC1	63014	VIZRA2	63015
VIZDEC2	63016	ID1RADCOR	63050	ID2RADCOR	63051
RANGE	63052	AZIM	63053	ELEV	63054
SAZIM	63055	SELEV	63056	GRANGE	63057
CAZIM	63060	CELEV	63061	RANGEDDT	63062
TRUERANGE	63063	SINORIENT	63064	COSGRIENT	63065
SINAZEL	63066	COSAZEL	63070	ACQAZIM	63071
ACQELV	63075	FRAMESIZE	63101	RADIOMETER	63102
TIMEODE	63103	FIRSTELEV	63104	ASTRCRA	63105
ASTRODEC	63106	ID1TIME	63130	ID2TIME	63131
TRUETIME	63132	CELTIME	63133	SCELTIME	63134
CONVERTIME	63135	SRADTIME	63136	HOURLMINUTE	63137
SECONDS	63140	DSECONDS	63141	ACTUALTIME	63142
ESTSHIFTED	63143	GMTSHIFTED	63144	GMTMCDU24	63145
BLASTOFF	63146	YEARMONTH	63147	DAY	63150
HOUREG	63151	MINREG	63152	FIRSTTHRU	63153
DUMSECTTG	63154	ID1RECD	63210	ID2RECD	63211
RECFILE	63212	ID1SYSPAR	63310	ID2SYSPAR	63311
RADARMODE	63312	SYSTAT1	63313	SYSTAT2	63314
SYSTATD	63315	DELTATEE	63316	FREQUENCY	63317
LONGITUDE	63320	GEODETLAT	63321	GEDCENLAT	63322
EQUATOR	63323	PDL	63324	AZIMOVER	63325
HEIGHT	63326	YRTRAN	63327	ZRTRAN	63330
SKIP	63331	AUCDNVER	63332	WFFREQ	63333
MAINSWITCH	63334	EXPNAME	63350	ID1ENTPNT	63410
ID2ENTPNT	63411	MCPGM	63412	INTER	63413
COCON	63414	RECD	63415	ADSCN	63416
AESCN	63417	CORCT	63420	DYDMP	63421
CHCDR	63422	PRLOG	63423	CELCMPGM	63424
DATANALYZE	63425	INTERCDM	63426	ACQUI	63427
RDMT	63430	CHPAR	63431	WFDR	63432
RDXRX	63433	PLANP	63434	TIMEP	63435
ID1RADIO	63440	ID2RADIO	63441	AZIMADD	63442
ELEVADD	63443	UOPPAD	63444	RANGEADD	63445
INAZIMADD	63446	INELEVADD	63447	WFACD	63450
ID3RADIO	63776	ID4RADIO	63777	AZIMCUT	64000
ID5RADIO	64776	ID6RADIO	64777	ELEVOUT	65000
ID7RADIO	65776	ID8RADIO	65777	DDPPDUT	66000
ID9RADIO	66776	ID10RADIO	66777	RECAZIM	67000
ID11RADIO	67776	ID12RADIO	67777	RECELEV	70000

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1. "Haystack Pointing System Ephemeris Tape Program", M. I. T. Lincoln Laboratory, Publication 1964-41. (In preparation)
2. Explanatory Supplement to the Astronomical Ephemeris and the American Ephemeris and Nautical Almanac (Her Majesty's Stationery Office, London, 1961).
3. R. Butler and E. Kerr, An Introduction to Numerical Methods (Sir Isaac Pitman and Sons, Ltd., London).

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1. ORIGINATING ACTIVITY (Corporate author) Lincoln Labs., Lexington, Mass.		2a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED	
		2b. GROUP N/A	
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4. DESCRIPTIVE NOTES (Type of report and inclusive dates) Group Report			
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11. SUPPLEMENTARY NOTES		12. SPONSORING MILITARY ACTIVITY ESD, L.G. Hanscom Field, Bedford, Mass.	
13. ABSTRACT This report describes the procedure used by the Haystack pointing computer program for obtaining the celestial coordinates of the Moon at any time.			

14. KEY WORDS	LINK A		LINK B		LINK C	
	ROLE	WT	ROLE	WT	ROLE	WT
<p>Haystack Moontrack Program Inputs Program Outputs Astronomical Significance</p>						

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